

Self-study Problems #6: Sexual selection and kin selection

1. List four ways in which having offspring is energetically costly for female primates.

pregnancy, lactation, additional travel, carrying the infant, exposure to predation

2. Because of the issues listed above, what appears to be the most important limiting factor that affects a female primate's reproductive success, in contrast to a male's?

access to food (survival of offspring is also has a greater impact on female reproductive success, but in actual practice, this seems to be a smaller factor than access to food)

3. What is the biggest factor that affects a male primate's reproductive success, in contrast to a female's?

success in mating

4. Why would natural selection favor females who were able to act submissive, that is, to lose out in a confrontation with another female?

it reduces a female's chance of getting injured in a dominance fight

5. Explain why there is an inherent conflict between the behavioral strategy of a primate mother and the behavioral strategy of her infant.

mother: strategy is to care for infant just enough, then stop and have another offspring: strategy is to maximize care from mother, without limit

6. What is sexual selection?

selection that favors traits that increase male success in mating. These traits are typically features of males, but they may also be behavioral traits in females, such as female preferences for males with certain characteristics.

7. What is intrasexual selection?

selection due to differences in success at mating due to interactions of individuals of the same sex

8. What is the most common form of intrasexual selection? Explain.

male-male competition. Males compete directly (contest competition) for matings.

9. What is the most common form of intersexual selection? Explain and give an example.

female choice. Females prefer males with some given trait. Examples: male peacock tails, male mandrills's faces, male proboscis monkeys's noses, etc.

10. Explain why male baboons have larger canines and larger bodies than female baboons.

Large bodies and canines improve success in competition with other males for access to females, so they are favored in males (male-male competition). These features require energy to grow and maintain, but provide little benefit to females, so selection tends to weed them out from females.

11. Explain why monogamous primates such as gibbons and siamangs show very little sexual dimorphism.

Monogamous primates experience very little male-male competition, since each male has relatively unimpeded access to one female and very little access to others, so all males have roughly the same success at mating. So there is little selection to favor larger males.

12. Compared to other primates, how much sexual dimorphism is there in humans?

Relatively little

13. What does the previous answer suggest about human social organization in the past?

Humans and our ancestors have probably been mostly monogamous for much of our recent evolution

14. Explain how natural selection has apparently favored infanticide among some primates.

In primates with single-male, multi-female groups, or multi-male, multi-female groups (in which there are generally many fewer males than females)...

when a new male takes over the group,

or rises significantly in the dominance hierarchy from a lower rank where he could not mate much to a higher rank where he can mate often...

he can increase his mating success

by killing nursing infants, which are offspring of other males, so this does not hurt his r.s.

without a nursing infant, the mothers go into estrus

and the new male can mate sooner than he would otherwise, increasing his reproductive success

15. What is altruistic behavior (in the context of primate behavior)?

behavior that has a cost to the actor and a benefit to another individual

16. What fraction of their alleles are shared through descent by

- a. a mother and her offspring? 0.5
- b. two full siblings? 0.5
- c. an individual and her full sibling's offspring? 0.25

17. What is inclusive fitness?

the total number of copies of an individual's alleles in the next generation, both directly (through offspring), and indirectly (through relatives' offspring)

18. Explain how natural selection could lead to altruistic behavior, using the concepts of kin selection, inclusive fitness, and Hamilton's rule.

Altruistic behavior can be favored if the recipient is a relative of the actor, and the cost to the actor is less than the benefit to the recipient, discounted by the fraction of alleles that they share by descent. In that case, the behavior causes more of the actor's alleles to get into the next generation, through the additional offspring that the related recipient has due to the altruistic action...so the alleles that encourage the altruistic behavior become more common.

written as Hamilton's rule: $rb > c$

where r =coefficient of relatedness (or average of the coefficients if there are multiple recipients)

b =benefit to the recipient's reproductive success

c =cost to the actor's reproductive success